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ABSTRACT

This study tested the effects of two instructional sequences--principle-procedure and procedure-principle--on the application and transfer of learning. It was hypothesized that a principle-procedure sequence would result in better near-transfer and far-transfer and that students would prefer this sequence. The 38 freshmen enrolled in a business studies course at a community college who served as subjects were divided on a stratified random assignment into two groups. Two modules--a Principle Module and a Procedure Module--were prepared in booklet form on the topic of presentation of a statement of changes in financial position. Students in the two groups were given the same instruction, differing only in the order in which the modules were presented. A posttest measured near-transfer and far-transfer learning, and a post-questionnaire gathered personal data and responses on attitudes and preferences regarding the sequencing of instruction. Results showed no significant difference in learning outcomes but there was a general preference for the principle-procedure sequence. Eight references are provided as well as a list of other publications in this series of working papers. (Author/MES)

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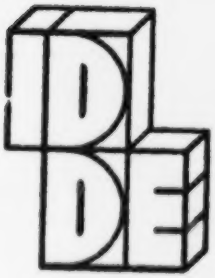

INSTRUCTIONAL DESIGN, DEVELOPMENT, AND EVALUATION

WORKING PAPERS

THE EFFECT OF PRINCIPLE-PROCEDURE AND PROCEDURE-PRINCIPLE SEQUENCING ON LEARNING OUTCOMES

by

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ABSTRACT

This experimental study tested the effects of two instructional sequences (principle-procedure and procedure principle) on application and transfer learning. It also looked at which sequence students preferred.

The students were 38 freshmen in two classes of a business accounting course at the Onondaga Community College.

Results of the study on both near-transfer and far-transfer learning showed no significant differences between the two treatment groups. Due mainly to methodological problems and limitations the study lacked the power to detect any real differences that might exist between the groups. With respect to students' preference for which sequencing order they liked, there was general preference for the principle sequence. Fifty-five percent indicated they preferred working with the principle-first sequence, thirty-four percent liked the procedure-first sequence, and the rest were neutral.

The results of our study should not be regarded as conclusive. Further investigations for supporting both hypotheses are necessary.

THE EFFECT OF PRINCIPLE-PROCEDURE AND PROCEDURE-PRINCIPLE SEQUENCING ON LEARNING OUTCOMES

Introduction

Instructional sequencing is a big issue in designing instruction. There is still considerable disagreement to answer the question: "What sequence will result in optimal learning gains?" Some theoretical views support the principle-procedure sequence, while other views support the procedure-principle sequence. A principle is a change relationship that happens with regularity; usually a principle is a cause-and-effect relationship. A procedure, on the other hand, is an ordered set of actions that are intended to achieve a goal.

The principle-procedure sequence teaches a change relationship first, followed by the actions to achieve a goal, while the procedure-principle sequence teaches the same content the other way around. Therefore, the purpose of this study is to investigate the effect of the two instructional sequences on learning outcomes.

Theoretical Predictions

Ausubel's (1968) theory presents the principle of subsumption which describes the way knowledge is made available to learners and the way the learners assimilate the information into their cognitive structures. According to Ausubel there are two kinds of learning: meaningful and rote.

Meaningful learning occurs when the new information is assimilated to the relevant concept which is already available in cognitive structure to serve a subsuming role or to provide ideational anchorage. The initial effects of subsumption facilitate both learning and retention. Rote learning is memorization, the new information is relatively isolated entities and are not subsumed into an existing cognitive structure, therefore the new information is easy to forget. A principle in this regard is viewed as potentially meaningful. A principle provides a meaningful understanding of the procedure; it is an underlying process upon which the procedure is based. Therefore, the new information can be subsumed into the existing cognitive structure. On the other hand, a procedure provides an efficient way of achieving a goal based on the principle. A procedure can be learned meaningfully or rotely; when only a memorization of the steps occurs, without assimilation into the available structure, it is learned rotely. Based on Ausubel's (1968) work, we propose that the principle-procedure sequence will result in more meaningful learning and retention than the procedure principle sequence.

The elaboration theory by Reigeluth indicates two levels for organizing instruction, based on their scope: micro strategies and macro-strategies. A micro strategy is a way of organizing instruction on a single topic. It includes such strategy

component as generality, examples and practice. A macro-strategy is a way of organizing those aspects of instruction which relate to more than one topic, such as sequencing the topics and showing interrelationships among the topics. The elaboration theory proposes that if instruction is organized in a certain way, then the instruction will result in higher levels of learning, synthesis, retention and affect. The elaboration model of instruction starts by presenting knowledge on a very general level and proceeds to more detailed ideas (macro-strategy). The theory supports the use of the principle-procedure sequence rather than the procedure-principle sequence.

The Component Display Theory (CDT) developed by Merrill (1983) defines a principle as a change relationship that happens with regularity. It indicates how a change in something is related to a change in something else. Usually a principle is a cause and effect relationship; it explains consistent causes or predicts consistent effects of events that happen. On the other hand a procedure is defined as an ordered set of actions that are intended to achieve a goal. There is often more than one way or procedure for achieving any given goal. A procedure is often referred to as a technique, skill or method.

Research Results

Mayer and Greeno (1972) investigated the effects of learning the binominal distribution "concept" using two methods: one beginning with a statement of the formula and emphasizing the mechanical operations involved in using it (Formula group); and the other beginning by relating the variables in the formula to concepts that presumably were part of the subjects' general knowledge (General Concept group).

An analysis of variance indicated no significant difference between the overall performance of the two treatment groups. However, the interaction between the instructional method and type of transfer items was significant. The formula group did significantly better on solving near-transfer problems, and the general concepts group did significantly better on solving far-transfer and recall problems. However there was an instrumentation invalidity in the procedure which affected the internal validity: learning time for each group was not controlled; in addition the subjects were permitted to refer to their teaching booklets during the test, which certainly affected subjects' outcomes. Therefore, an additional study which controls learning time for each group is necessary.

Tilden and Will (1983) studied the effect of principle and procedure sequence on near and far transfer in teaching Financial Accounting. The subjects were business major students at a community college, and were randomly assigned into two experimental groups and a control group. The first group received the principle-procedure sequence and the second group received the procedure-principle sequence, while the control group received the posttest first, and the study materials were

presented to them after they completed the test.

The analysis of variance indicated that the principle procedure group did significantly better in near transfer than did the procedure-principle group. No significant difference was found on far transfer. On the post-questionnaire, students indicated that they did not have enough time to complete the procedure lesson or the test. To improve the study, further research which provides enough time should be conducted.

LoParco and Rogers (1984) studied the effect of principle and procedure sequencing on recall and transfer of knowledge. There were three groups used in the study: 1) principle procedure, 2) procedure-principle and 3) control group. The subjects were informed that the result of the test would not affect their grade, but they were encouraged to do their best. The analysis of variance showed no significant difference among the three groups' achievement on the total acquisition (near-transfer, far-transfer, and recall combined). But a one-way analysis of variance indicated that the principle-procedure group did significantly better than the control group on the recall questions.

The above review of the literature shows a lack of conclusive evidence about the optimal sequence for a related procedure and principle. There were some problems found in the studies such as time alotted, procedure or the method. Therefore, this study will try to control for previously identified problems.

The purpose of the study is to investigate which sequence is better on near-transfer and far-transfer: principle-procedure or procedure-principle. Near transfer is use-a-generality: the application of a previously taught generality or rule to a new specific case. Far transfer is the discovery of a new generality that is related to a known generality, along with its application to an example of that new generality. In addition, the students' attitudes will also be investigated.

We hypothesize that the sequence of instruction on a procedure and related principle will influence near-transfer, far-transfer and students' attitudes:

H 1: A principle-procedure sequence will result in better near-transfer and far-transfer than will the procedure-principle sequence.

H 2: A principle-procedure sequence will be more liked by the students than the procedure-principle sequence.

METHOD

Students:

The students for this experimental study were 38 freshmen (21 male and 17 female) attending a business studies course at the Onondaga Community College during their second semester. These students, of average academic ability, were from two consecutive classes: Class I had 22 freshmen (12 male and 10 female) from 9:00 - 10:00 a.m.; and Class II had 16 freshmen (9 male and 7 female) from 10:00 - 11:00 a.m. The task was part of their normal course work. The students had no prior knowledge about the content area used in this study. On the day of the experiment each class was divided on a stratified random assignment into two groups: each with equal distribution of good, medium, and low ability students based on their Grade Point Average.

Design:

The research design for this study was the Posttest-Only Control Group design (Campbell and Stanley, 1966, p. 25). The statistical design was a t-test.

Task and Materials:

The task was how to present a statement of changes in financial position with working capital. The instruction was developed by the Business and Accounting instructor according to the micro-strategy approach of Merrill's (1983) Component Display Theory. There were two modules, a Principle Module and a Procedure Module, each of which contained a generality, examples and practice items followed by feedback.

The Principle Module contained principles relating to the financial changes affecting working capital with an emphasis on the interrelationship of the sources (inflows) and uses (outflows) of working capital as the Generality (see Figure 1). The three examples were on working capital transactions showing

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Insert Figure 1 about here

---

whether they have any effect on financial resources. There were four practice items followed by feedback (see Figure 2).

Insert Figure 2 about here

This section presents the principles relating to the financial changes effecting Working Capital.

STATEMENT OF CHANGES IN FINANCIAL POSITION - Working capital basis starts with an emphasis on the interrelationship of the sources (inflows) and uses (outflows) of working capital.

WORKING CAPITAL - the chief sources of working capital are: 1) operations, 2) additional investments by owners, 3) long term borrowing, and 4) the sale of non-current assets. Since the sources of working capital are those financial items that result in an increase in working capital, it is necessary to know how those items cause it to increase. An increase in working capital (source of working capital) must result from:

1. An increase in total assets without a corresponding increase in total current liabilities.
2. A decrease in total current liabilities without a corresponding decrease in total current assets.

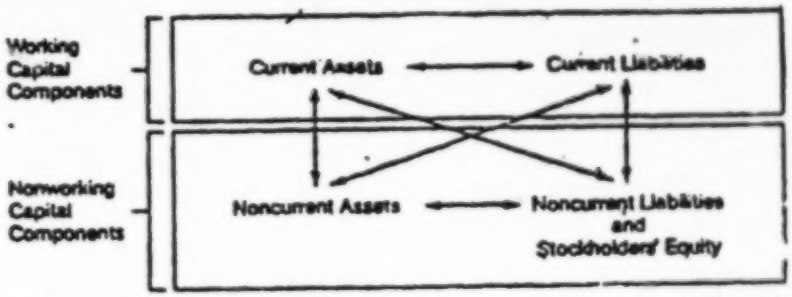
The chief uses of working capital are: 1) purchases of noncurrent assets, 2) payment of long term debt, and 3) reduction of the owners' or the stockholders' equity by drawings of dividends. A decrease in working capital (use of working capital) must result from:

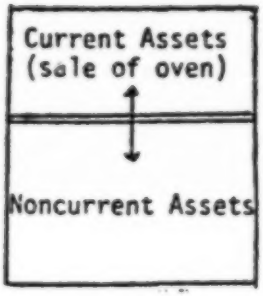
1. A decrease in total current assets without a corresponding decrease in total current liabilities.
2. An increase in total liabilities without a corresponding increase in total current assets.

FIGURE 1:
GENERALITY IN THE PRINCIPLE SEQUENCE

EXAMPLE

The following diagram classifies working capital transactions in distinctive categories on the basis of whether or not they have an effect on financial resources. Only transactions that cross the double line cause a change in working capital.





1. The Round Bakery Company sells an old oven for cash and does not replace it. Since there is a net increase in current assets with no corresponding increase in current liabilities, there is a not increase in working capital.

PRACTICE

Directions: Circle the appropriate answer. Do not turn the page until you have completed all of these exercises.

1. Beach Corporation decides to open a new plant. In order to do this, they exchange 10,000 shares of common stock for property and land. This creates increase/decrease/no effect in working capital.

2. Beach hears the vacant Smith Corona plant in Groton, New York is for sale for $350,000 cash. They snap it up! This represents increase/decrease/no effect in working capital.

ANSWERS TO PRACTICE

1. No effect

2. Decrease

FIGURE 2:
AN EXAMPLE AND TWO PRACTICE ITEMS WITH FEEDBACK

The Procedure Module presented the procedure or ordered steps relating to the measurement and calculation of financial changes effecting working capital. It included three main steps (see Figure 3).

Insert Figure 3 about here

Since the steps in the procedure were rather long, time constraints required that only one example be given to the procedure module, whereas three examples were given in the principle module. There were also four practice items with feedback in this module (see Figure 4).

Insert Figure 4 about here

The two modules were presented in a single booklet.

Treatments:

There were two treatment groups: the Principle-first group (Pri-1st) and the Procedure-first group (Pro-1st). Students in the two groups were given exactly the same instruction. The only difference between the groups was the presentation order of the two modules. Students in the Pri-1st group received the booklets containing the Principle Module first followed by the Procedure Module. Students in the Pro-1st group started with the Procedure Module, then worked subsequently on the Principle Module.

Test and Measures:

There were 16 test items in the posttest. Eight items tested students' near-transfer learning; and eight tested far-transfer learning (see Figure 5). Of the eight test items

---

Insert Figure 5 about here

---

on near-transfer learning, four of them were on the principle relating to financial changes effecting working capital, and four were on the procedure for preparing a statement of changes in financial position. For far-transfer learning there were also

PREPARING THE STATEMENT OF CHANGES IN FINANCIAL POSITION WORKING CAPITAL BASIS

This section presents the procedures relating to the measurement of financial changes effecting Working Capital.

Transactions that change a current and noncurrent account (working capital) are reported in the Statement of Changes in Financial Position as a use of financial resources. This is accomplished by completing the following steps:

Step 1: Determine the net change in Working Capital and the change in its components. This is called Part B.

Step 2: Analyze the changes in all noncurrent accounts and contributions from operations to determine the sources and uses of financial resources.

Step 3: The information derived from the analysis of the noncurrent accounts and operations (Step 2) is combined with the previously prepared Part B to form the STATEMENT OF CHANGES IN FINANCIAL POSITION.

FIGURE 3:
GENERALITY IN THE PROCEDURE SEQUENCE

Example 1

Step 1 Preparing the Schedule of Changes in Working Capital Components (Part B)

Regardless of what analytical approach is used, the first step in preparing the statement of changes in financial position - working capital basis is to determine the net change in working capital and the change in its components. For Orange Company, I: these are shown in Figure 20-5. Labeled "Part B," it becomes an integral part of the final formal statement of changes in financial position (shown later, in Figure 20-6). This schedule shows what working capital items did change; it does not tell what caused the items to change.

Part B—Schedule of Changes in Working Capital Components

	December 31		Changes in Working Capital	
	1983	1982	Increase	Decrease
Current assets				
Cash	$230,000	$232,000		$ 2,000
Accounts receivable (net)	85,000	72,000	$13,000	
Merchandise inventory	112,000	92,000	20,000	
Unexpired insurance	3,700	4,700		1,000
Total current assets	$430,000	$390,000		
Current liabilities				
Accounts payable	$ 65,000	$ 44,000	21,000	
Bank loans payable (short term)	31,500	26,500		5,000
Accrued payables	3,500	2,500		1,000
Total current liabilities	$ 80,000	$ 73,000		
Working capital	$350,000	$317,000		
Net increase in working capital			$33,000	$ 3,000
				30,000
			$54,000	$54,000

Figure 20-5 Schedule of Changes in Working Capital Components of Orange Company, Inc.

PRACTICE

Do not turn the page until you have completed all of these exercises.

1. Identify the appropriate Step.

   Analyze the changes in all concurrent accounts to determine the sources and uses of financial resource. Step ----.

   The information derived from the analysis of the concurrent accounts is combined with the previously prepared Part B to form a statement of changes in financial position - working capital basis. Step ----.

   Determine the net change in working capital and the change in its components. Step ----.

ANSWERS TO PRACTICE

1. Step 2

   Step 3

   Step 1

FIGURE 4:
AN EXAMPLE, A PRACTICE ITEM AND ITS FEEDBACK

Posttest

Number of Items on Near-Transfer

4 items — Test Principle Sequence

e.g. American Airlines annual Depreciation charges have what effect on Working Capital:

( ) INCREASE
( ) DECREASE
( ) NO EFFECT

4 items — Test Procedure Sequence

e.g. Analyze the changes in the following accounts to determine the sources or uses of Working Capital. Working Capital provided by Operations:

Net Income	$90,000
Depreciation	15,000
Bad Debts Expense	500
TOTAL	

Number of Items on Far-Transfer

4 items — Test Principle Sequence

e.g. Beach purchases equipment for the new plant on-account (Accounts Payable). What effect does this transaction have on Working Capital:

( ) INCREASE
( ) DECREASE
( ) NO EFFECT

4 items — Test Procedure Sequence

e.g. The goodwill amortization are the major advertising agency would:

( ) Be shown as an adjustment to operating income
( ) Is not considered
( ) A noncurrent adjustment

FIGURE 5:
DISTRIBUTION AND EXAMPLES OF TEST ITEMS FOR NEAR-TRANSFER AND FAR-TRANSFER

four test items relating to the financial statement principle, and four on the procedure (see Figure 6).

Insert Figure 6 about here

Both near transfer and far transfer are related to the application level of learning a generality. Near transfer learning is use-a-generality, the application of a previously taught generality or rule to a new (previously unencountered) instance. Far transfer learning is the discovery of a new generality that is related to a known generality and its application to an instance of that new generality.

Students were also given a post-questionnaire to ascertain which sequence they liked to work with: the principle-procedure sequence or the procedure-principle sequence. A five-point scale of two dimensions with the principle-procedure sequence at one end and the procedure-principle sequence at the other was used. The highest numeral (5) on the scale denoted 'very much preference' for the principle-first sequence and the lowest numeral (1) on the opposite end 'very much preference' for the procedure-first sequence. The center numeral (3) denoted neutrality. The post-questionnaire also asked the length of time they took to work on the principle module, the procedure module and the posttest.

Procedure:

On the day of the experiment students in each class were randomly assigned to two treatment groups, each having an equal distribution of high, medium and low ability students. Once the students were seated, the booklets were distributed to them. A signal was then given for them to begin their learning task (i.e., the Pri-1st group started with the Principle Module and the Pro-1st group the Procedure Module). Each group had 15 minutes to work on their first module. All students were instructed not to refer to the next module in the booklets. At the end of 15 minutes, the instructor gave a signal to stop and to close all booklets. Soon after, a signal was given again for the students to proceed with the second module (i.e., the Pri-1st group now worked on the Procedure Module and the Pro-1st group the Principle Module). At the end of another fifteen minutes the students were again told to stop and close the booklets.

Students were then instructed to begin the posttest, which contained both near and far transfer items. Students had fifteen minutes to complete the test. On completion of the posttest, students handed in the booklets to the instructor. Each student was then given a post-questionnaire for their personal data and responses on their attitudes and preferences regarding the

Test

1. Slippery Sam's Used Cars purchased a new shed on account for use as an Office. This transactions has what effect on Working Capital:

   ( ) INCREASE
   ( ) DECREASE
   ( ) NO EFFECT

2. Compute the Changes in Working Capital:

	December 31		Changes in Working Capital	
	1983	1982	Increase	Decrease
Current Assets:				
Cash	$786,000	$854,000		
Merchandise Inventory	972,000	852,000		
Current Liabilities:				
Accounts Payable	626,000	952,000		
Accrued Wages Payable	550,000	489,000		
Net Change in Working Capital				

15. Lower cost or market valuation of temporary investment in marketable securities is:

   ( ) Treated in Part B
   ( ) Noncurrent account
   ( ) An adjustment to operating income

16. Assuming IBM exchanges $1 million of commercial paper for an equal value bond issue, the effect on working capital is:

   ( ) INCREASE
   ( ) DECREASE
   ( ) NO EFFECT

FIGURE 6:
SAMPLE OF TEST ITEMS SHOWING 2 NEAR TRANSFER ITEMS ON PRINCIPLE SEQUENCE AND PROCEDURE SEQUENCE (QUESTIONS 1 & 2); AND 2 FAR-TRANSFER ITEMS ON PROCEDURE SEQUENCE AND PRINCIPLE SEQUENCE (QUESTIONS 15 & 16).

sequencing of their instruction.

All students in the Pri-1st and the Pro-1st groups completed their two modules well within the alloted time. The average time for the principle module was ten-twelve minutes, the procedure module eleven to thirteen minutes, and between twelve and fourteen minutes for the test.

RESULT

Hypothesis 1: It was hypothesized that the principle procedure sequence would result in better near transfer and far transfer than would the procedure-principle sequence. However, results from the one-tailed t-test at $p<.05$ indicated this hypothesis was not supported. The t-test for the near transfer yielded a t-value of .24 at the .80 level (no significant difference). The t-test for the far transfer yielded a t-value of .53 at the .59 level (no significant difference) (see Table 1).

Insert Table 1 about here

Hypothesis 2: It is hypothesized that the principle procedure sequence would be more liked and preferred by the students than the procedure-principle sequence. The data revealed that students in both groups had no strong preference towards the two instructional sequences (see Figure 7).

Insert Figure 7 about here

Although no significance test was computed, the students in the principle-procedure group appeared to slightly favor their sequence, while the procedure-principle students appeared to not prefer their own sequence: instead they too slightly favored the principle-procedure sequence.

DISCUSSION

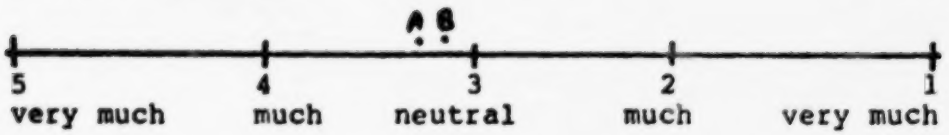
Before drawing any conclusion, some factors that could have affected the results need to be discussed. Previous studies, notably Tilden and Will (1983), indicated that many students could not complete their tasks. So to control the time constraint, each module was appropriately designed, based on the instructor's years of experience, to accomodate the time factor. By condensing the information in the generality, by not providing enough examples particularly in the procedure sequence, and by

Score	Sequence: Pri-first	Sequence: Pro-first	t	p
NT	x = 2.78 (34.8%) S = 1.51 n = 19	x = 2.89 (36.1%) S = 1.10 n = 19	.24	.80 (nsd)
FT	x = 3.36 (42.1%) S = 1.25 n = 19	x = 3.57 (44.7%) S = 1.16 n = 19	.53	.50 (nsd)

TABLE 1:
COMPARISONS OF PRINCIPLE-PROCEDURE SEQUENCE AND PROCEDURE-PRINCIPLE SEQUENCE IN NEAR-TRANSFER AND FAR-TRANSFER

NOTE: two-tailed t-test at $p<.05$ level

x = means, S = Standard Deviation, n = students sample, NT = Near Transfer, FT = Far Transfer, nsd = no significant difference.



NOTE: A is the average result of 19 students in the Principle-first group (3.3)

B is the average result of 19 students in the Procedure-first group (3.2)

FIGURE 7:
STUDENTS' PREFERENCES TOWARDS THE TWO INSTRUCTIONAL SEQUENCES

not providing enough practice items in both modules, it appears that a "floor effect" was created: the means were low in both groups, even though all student in the treatments completed their tasks and tests well within the fifteen minutes that were alloted to each module and the post-test.

Another concern is the small number of posttest items which could have reduced the power of the measures.

These limitations reduced the power of our study to detect any real differences that might exist between the treatment groups.

With these comments in mind, we will now discuss the results. The results indicated no significant difference between the principle-procedure and the procedure-principle groups. On the basis of the analysis, it appears that our first hypothesis based on the theoretical perspective that the principle-procedure sequence results in better learning was not supported. But because of the limiting factors in the study the conclusions cannot be conclusive.

An earlier study by Tilden and Will (1983) indicated that the principle-procedure group did significantly better in near transfer than the procedure-principle group. However, many of the students were not able to complete their tasks. LoParco and Rodgers' study (1984) showed no significant difference among their three groups in the achievement scores in near transfer or far transfer or recall and retention learning. But because of methodological problems, their study was not conclusive either. Though our investigation managed to control to a certain extend the problems identified in previous studies, such as the time factor and the amount of examples and practice and the number of test items, it appears from our results that, to achieve greater power between the groups, the modules need to be richer with more examples, more practice items, more test items, and most likely planned for a longer learning time.

In the post-questionnaire, students were asked which sequence, principle-first or procedure-first they preferred to work with. More than half (55%) from both groups indicated that they preferred working with the principle-first sequence. About one third (34%) of the students said they preferred the procedure-first sequence; the rest had no preference for either. Though our second hypothesis was not supported, the results are not conclusive: students however appear to like and prefer the principle-first sequence better than the procedure-first sequence.

Due to the limitations and methodological problems mentioned, our investigation was not able to come to any conclusions. Previous research, however, has shown tentative conclusions that the principle-first sequence resulted in better near-transfer and far-transfer learning. They have yet to be confirmed. So more research is still necessary to determine

which instructional sequence, principle-first or procedure-first, will result in more optimal learning gains. Hence we recommend replication of our study.

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The following is a list of IDD&E Working Papers that have been published. With the exception of the * titles, these Working Papers are available at 50c each plus postage.

*1. Meaningfulness and Instruction: Relating What is Being Learned to What a Student Knows by Charles M. Reigeluth, March 1980 (34 pp.)

*2. Relating What is to be Learned to What is Known: Subsumptive Sequencing, Coordination, and Cognitive Strategies Activation by Faith S. Stein, Jody K. Witham and Charles M. Reigeluth, April 1980 (44 pp.)

*3. Toward a Common Knowledge Base: The Evolution of Instructional Science by Charles M. Reigeluth, August 1980 (44 pp.)

*4. Using Videodiscs in Instruction: Realizing Their Potential Through Instructional Design by Charles M. Reigeluth and Joanne Garfield, September 1980 (41 pp.)

*5. The Use of Sequence and Synthesis for Teaching Concepts by Linda Frey and Charles M. Reigeluth, December 1981 (16 pp.)

*6. A Comparison of Three Instructional Presentation Formats by Bonnie Keller and Charles M. Reigeluth, January 1982 (30 pp.)

*7. Type and Position of Adjunct Questions: Their Effects on Memory and Application by Afnan N. Darwazeh and Charles M. Reigeluth, February 1982 (10 pp.)

*8. The Effects of Sequence and Synthesis on Concept Learning Using a Parts-Conceptual Structure by C. Herbert Carson and Charles M. Reigeluth, February 1983 (23 pp.)

*9. The Effects of Analogies on Student Motivation and Performance in an Eighth Grade Science Context by Ruth V. Curtis and Charles M. Reigeluth, March 1983 (31 pp.)

*10. Use of the ARCS Model of Motivation in Teacher Training by John M. Keller, March 1983 (9 pp.)

11. The Effect of Three Different Kinds of Feedback: Hint, Correct Answer, and Right/Wrong by Betty Feng and Charles M. Reigeluth, April 1983 (19 pp.)

12. Effects of Four Instructional Sequences on Application and Transfer by Chun-I Chao, Luz Ruiz and Charles M. Reigeluth, May 1983 (23 pp.)

13. The Effects of Format of Synthesizer on Conceptual Learning by Lois McLean, N. Kei Yeh and Charles M. Reigeluth, June 1983 (23 pp.)

14. Current Trends in Task Analysis: The Integration of Task Analysis and Instructional Design by Charles M. Reigeluth, July 1983 (20 pp.)

15. Motivation Design by John M. Keller, August 1983 (12 pp.)

16. Restructuring: The Key to a Better Educational System for an Information Society by Charles M. Reigeluth, September 1983 (22 pp.)

17. Teaching Common Errors in Applying a Procedure by Fredy E. Bentti, Anthony R. Golden and Charles M. Reigeluth, October 1983 (17 pp.)

18. Teaching Common Errors in Applying a Procedure by Alberto O. Garduno, Stephen Marcone and Charles M. Reigeluth, November 1984 (20 pp.)